ity of electrodes that are positioned in columns and rows so as to form a grid array. The columns and rows are generally based on the Cartesian coordinate system and thus the rows and columns correspond to the x and y directions.

[0013] The touch pad may also include sensing electronics for detecting signals associated with the electrodes. For example, the sensing electronics may be adapted to detect the change in capacitance at each of the electrodes as the finger passes over the grid. The sensing electronics are generally located on the backside of the circuit board. By way of example, the sensing electronics may include an application specific integrated circuit (ASIC) that is configured to measure the amount of capacitance in each of the electrodes and to compute the position of finger movement based on the capacitance in each of the electrodes. The ASIC may also be configured to report this information to the computing device.

[0014] Referring to **FIG. 1, a** touch pad **10** will be described in greater detail. The touch pad is generally a small rectangular area that includes a protective shield **12** and a plurality of electrodes **14** disposed underneath the protective shield layer **12**. For case of discussion, a portion of the protective shield layer **12** has been removed to show the electrodes **14**. Each of the electrodes **14** represents a different x, y position. In one configuration, as a finger **16** approaches the electrode grid **14**, a tiny capacitance forms between the finger **16** and the electrodes **14** proximate the finger **16**. The circuit board/sensing electronics measures capacitance and produces an x, y input signal **18** corresponding to the active electrodes **14** is sent to a host device **20** having a display screen **22**. The x, y input signal **18** is used to control the movement of a cursor **24** on a display screen **22**. As shown, the input pointer moves in a similar x, y direction as the detected x, y finger motion.

SUMMARY OF THE INVENTION

[0015] In view of the foregoing, it would be desirable to provide a media player with a touch pad. It would also be desirable to provide a hand held device with a touch pad. It would additionally be desirable to provide a touch pad that can sense and resolve angular and/or radial positions of a moving object (e.g., finger) as it is moved in a rotating and/or radial manner across the touch pad. That is, a touch pad that is based on polar coordinates rather than Cartesian coordinates. It would be further desirable to transform the angular or radial movements into translational movements in the GUI of the display screen for scrolling and other related linear actions.

[0016] The invention relates, in one embodiment, to a media player for storing and playing media such as audio, video or images. The media player includes a housing that encloses internally various electrical components that provide computing operations for the media player. The media player also includes a touch pad supported by the housing and configured to provide one or more control functions for controlling various applications associated with the media player.

[0017] The invention relates, in another embodiment, to a pocket sized handheld computing device. The computing device includes computing hardware for providing at least one application. The computing device also includes a display screen configured to display text and graphics associated with the at least one application. The computing device additionally includes a touch pad configured to provide one or more control functions for allowing a user of the computing device to provide inputs to the at least one application.

[0018] The invention relates, in another embodiment, to a touch pad assembly for use in a computing device. The touch pad assembly has a touch sensitive surface for accepting contact with an object. The touch pad assembly is configured to provide polar coordinate information of the object relative to the touch sensitive surface when the object is moved about the touch sensitive surface.

[0019] The invention relates, in another embodiment, to a user input system having a touch pad, a display and a controller. The system is configured to convert angular or radial data associated with the touch pad into control inputs associated with the display. By way of example, the control inputs may correspond to translational movements associated with scrolling or other related linear actions.

BRIEF DESCRIPTION OF THE DRAWINGS

[0020] The present invention is illustrated by way of example, and not by way of limitation, in the figures of the accompanying drawings and in which like reference numerals refer to similar elements and in which:

[0021] **FIG. 1** is a simplified diagram of a touch pad and display.

[0022] **FIG. 2** is a perspective view of a media player, in accordance with one embodiment of the present invention.

[0023] **FIG. 3** is top view of a media player in use, in accordance with one embodiment of the present invention.

[0024] **FIG. 4** is a simplified block diagram of a touchpad/display system, in accordance with one embodiment of the present invention.

[0025] **FIG. 5** is a top view of a sensor arrangement of a touch pad, in accordance with another embodiment of the present invention.

[0026] **FIG. 6** is a top view of a sensor arrangement of a touch pad, in accordance with another embodiment of the present invention.

[0027] **FIG. 7** is a top view of a sensor arrangement of a touch pad, in accordance with another embodiment of the present invention.

[0028] **FIG. 8** is a partially broken away perspective view of an annular capacitive touch pad, in accordance with one embodiment of the present invention.

[0029] **FIG. 9** is a flow diagram of touch pad-display processing, in accordance with one embodiment of the invention.

DETAILED DESCRIPTION OF THE INVENTION

[0030] The present invention relates to touch pads. According to one aspect of the invention, a touch pad is provided on a media player to facilitate user interaction therewith. In one embodiment, the media player is a handheld device. According to another aspect of the invention, a touch pad is provided that can sense and resolve angular